proteins (such as IgG) toward the cathode when electrophoresis is performed at pH 8.[3]

Hemoglobin electrophoresis is not being advocated as a diagnostic test for multiple myeloma (or as a routine procedure for 64-year-old black men, for that matter). However, the experience reported herein shows that a watchful eye on the part of hemoglobin electrophoresis pattern interpreters may be able to distinguish situations such as the increased hemoglobin A_3 which may accompany lead intoxication,[4] the decreased erythrocyte carbonic anhydrase (which migrates near hemoglobin A_2) associated with thyrotoxicosis,[5] as well as paraproteinemia.

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REFERENCES

1. Lehmann H, Kynoch PAM: Human Haemoglobin Variants and Their Characteristics. Amsterdam, North-Holland Publ, 1976
2. Sheena AH, Fox FA, Bayha M, et al: A simple microtechnic for screening abnormal hemoglobins and for quantitation of A2 hemoglobin by electrophoresis on cellulose acetate. Am J Clin Pathol 1968; 50:142-145
3. Gordon BL II: Essentials of Immunology, 2nd Ed. Philadelphia, FA Davis Co., 1974, p 56
4. Charache S, Weatherall DJ: Fast hemoglobin in lead poisoning. Blood 1966; 28:377-386
5. Auton JA, Carter ND, Barragry JM, et al: Rapid diagnosis of thyroid disease using carbonic-anhydrase immunoassay. Lancet 1976; 2:1385-1387

Leukemia in Hospital Patients With Occupational Exposure to the Sawmill Industry

TO THE EDITOR: A recent report by the International Agency for Research on Cancer (IARC)[1] concluded that available data indicate a possible association between exposure to the lumber and wood products industries and hematopoietic and lymphoreticular cancer. Some of the studies reviewed implicated chemicals such as chlorophenols used in the treatment of the wood and phenoxy herbicides used in the forest as possible causal agents. Greene and co-workers[2] also suggested that chemical exposures in the sawmill industries may be related to Hodgkin's disease in workers; Milham and Petersen,[3,4] in studies of death certificates in Washington and California, link a number of cases of lymphatic and hematopoietic cancer to occupational wood exposure; Bross and associates[5] also showed high risks of myeloma to workers in these industries.

A surveillance study in southern Oregon carried out in 1980 by the University of Utah Research Institute and sponsored by the National Institute for Occupational Safety and Health (contract 210-78-0066) obtained results that are consistent with the above findings and are briefly presented here to provide additional insight into these relationships.

TABLE 1.—*Leukemia Cases by Sawmill Exposure and Age Category*

Age	Group	No. of Cases: No Exposure	<10 Years Exposure	≥10 Years Exposure	Relative Risk: <10 Years Exposure	≥10 Years Exposure
35-54	Case	1	1	1	2.0	4.6
	Control	138	68	30		
55-64	Case	2	0	1	0.0	1.7
	Control	117	51	34		
65-74	Case	7	3	4	1.2	2.4
	Control	158	55	37		
75 +	Case	2	1	3	1.2	6.8
	Control	91	37	20		
Total	Case	12	5	9	1.1*	3.2*
	Control	504	211	121		

Summary x^2 (1 df) = 5.67, $P = .017$
Case: ICD-9-CM Codes 204-208
Control: ICD-9-CM Codes 001-139, 240-279, 580-611, 740-759, 780-799, 960-999, V01-V82

*Age-adjusted summary relative risk.

The study was undertaken to evaluate the adequacy of hospital records for occupational health surveillance. Brief occupational questionnaires were administered for a year to all men entering four hospitals in Jackson, Josephine and Klamath counties, Oregon, to be used in conjunction with available computerized medical abstract data. Data on 9,612 admissions were collected with a response rate to the questionnaire of 90 percent for the diagnoses reported in Table 1. A control group was chosen composed of patients with a variety of primary diagnoses selected on the basis that they were unlikely to be related to the exposures under study. This control group accounted for 16 percent of the total discharges and was used to evaluate groupings of all remaining diagnoses in a case-control fashion with respect to lumber and wood products exposures.

Neoplasms were one of the groupings evaluated. As a consequence of small numbers of cases, risks of neoplasms for lumber and wood products exposures did not generally show statistically significant increases; however, the highest relative risks for primary diagnoses were for leukemias (ICD-9-CM codes 204 to 208) in patients with sawmill exposure. To increase the numbers, secondary diagnoses were searched, revealing 11 additional cases, with 7 of these having sawmill industry exposure.

Table 1 summarizes the case-control relative risks by years of sawmill exposure separated by age group. A Mantel-Haenszel summary relative risk showed a threefold increase in leukemia risk to patients with ten or more years of sawmill industry exposure, with a Mantel-Haenszel summary x^2 for dose-response statistically significant at $P = .017$. The table excludes patients under 35 for whom very few high exposures were noted and excludes repeat discharges for the same diagnosis. In addition, patients with other types of lumber and wood products exposure are not included in the no-exposure group since these industries are somewhat related to the sawmill industry in terms of work exposures and thus might dilute the risks.

As a check on the adequacy of the control group, the overall study showed statistically significant increased relative risks to lumber and wood products workers for a multitude of musculoskeletal diseases, injuries, hernias, several gastrointestinal conditions and mononeuritis. Overall, about twice as many significant associations as would be expected by chance were found. A National Institute for Occupational Safety and Health study of Social Security disability awards[6] mirrors very closely the musculoskeletal and injury findings, hernias have also been noted by Goldberg[7] and neuritis as an occupational hazard is described by Mayers.[8]

The point of interest is that these data seem to corroborate the IARC findings, using data from a surveillance study in another setting. The increased risk for patients with a sawmill work history, and not necessarily for those with millwork and logging exposures, could be, in part, an artifact of sample size since there were more people with sawmill exposures, but could also be due to specific exposures such as the chemical hazards suggested earlier. For example, industrial hygiene surveys of plants in the study area indicate the use of chlorophenols and even wood dust itself may be suspect.

It should also be kept in mind that the methodology of a surveillance study is less rigorous, with the emphasis on large numbers of patients, many diseases and several exposures, at the expense of the more detailed exposure and disease data that can be collected in smaller definitive studies of one disease and one exposure.

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REFERENCES

1. IARC monographs on the evaluation of the carcinogenic risk of chemicals to humans—Wood, leather, and some associated industries. IARC Monogr Eval Carcinog Risk Chem Hum 1981; 25: 1-97
2. Greene MH, Brinton LA, Fraumeni JF, et al: Familial and sporadic Hodgkin's disease associated with occupational wood exposure. Lancet 1978; 2:626-627
3. Milham S: Neoplasia in the wood and pulp industry. Ann NY Acad Sci 1976; 271:294-300
4. Petersen GR, Milham S: Occupational Mortality in the State of California, 1959-1961. US Department of Health, Education, and Welfare publication No. (NIOSH) 80-104, 1980
5. Bross IDJ, Viadana E, Houten L: Occupational cancer in men exposed to dust and other environmental hazards. Arch Environ Health 1978; 33:300-307
6. Fischbach TS, Crouse W, Sestito JP, et al: Industrial Characteristics of Disabled Workers, 1975-1976. National Institute for Occupational Safety and Health Surveillance Report, In Press
7. Goldberg MN: Workers Safety in Logging Operations. US Department of Health, Education and Welfare publication No. (NIOSH) 74-103, 1974
8. Mayers MR: Occupational Health Hazards of the Work Environment. Baltimore, Williams & Wilkins, 1969, pp 112-114

High Rock, High Tech and Karl Marx

TO THE EDITOR: Another acronym, VDT, is in the news. VDT is not another sexually transmitted disease, nor does it have to do with alcohol withdrawal. As most physicians know, VDT stands for video display terminal.

VDT means excitement, high technology and, most of all, money. John Chancellor, on the evening news, tells the Horatio Alger story of the half a dozen youthful entrepreneurs who have rapidly amassed great fortunes in the computer industry.

There is this 30-year-old genius named Wozniak who used 12 million of his easily earned Apple II computer dollars to stage a "Western Woodstock." In the amphitheater there was a continuous flow of rock music, in an adjacent tent he had a glittering array of sophisticated computerized technology. Video display terminals were there for everyone to play with—high rock wedded to high tech. In the vernacular of the trade we are "on the fast track" to computer culture.

This would seem to epitomize the new and wonderful era on whose brink we now stand. The stodgy old work ethic can be discarded. Thanks to the computer, we can enjoy more and work less. Let the machines do our thinking for us. Grade school kids no longer need multiplication tables or long division. At ready are their handy pocket calculators. Doctors can call on their computers for a quick diagnosis and the proper treatment protocol. No more head-scratching. No more soul-searching. Should it be that a mistake was made and the patient dies, let them sue the computer. High rock and high tech and a VDT in every office and every kitchen—the dream of tomorrow.

But there are dark clouds on the horizon. An